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ARMY TACTICAL COMMAND AND CONTROL SYSTEM (ATCCS)

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BENEFIT ANALYSIS VOLUME 2 (U) ARMY TRADOC ANALYSIS

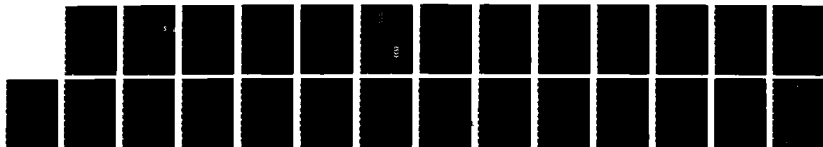
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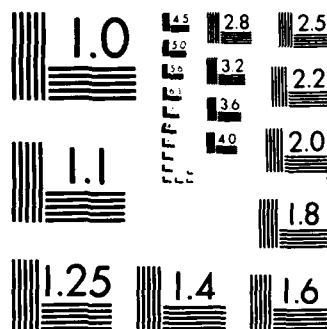
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ARMY TACTICAL COMMAND AND CONTROL SYSTEM (ATCCS)
BENEFIT ANALYSIS

VOLUME II: MAIN REPORT WITH APPENDIX I - FIGURES

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Approved for public release
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APPENDIX I

FIGURES

DISCLAIMER

The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

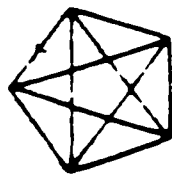
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2.5.2
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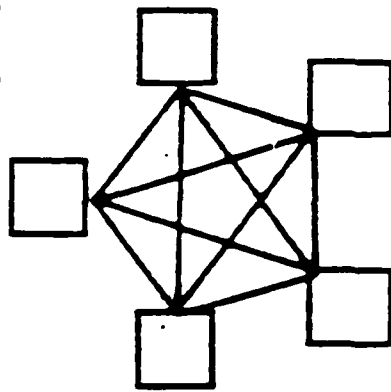
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COMMAND

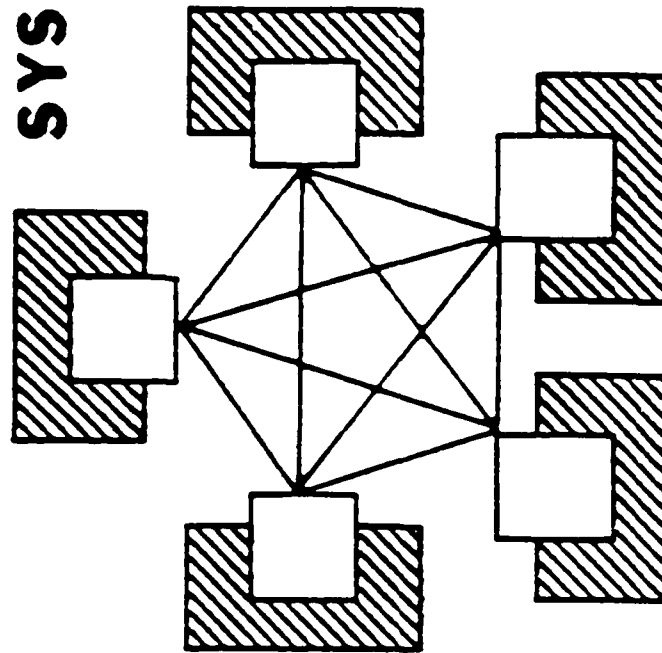


CONTROL



AND

**SUBORDINATE
SYSTEMS**



CCS2

Figure 2-1. CCS2 architecture

CCS² ARCHITECTURE

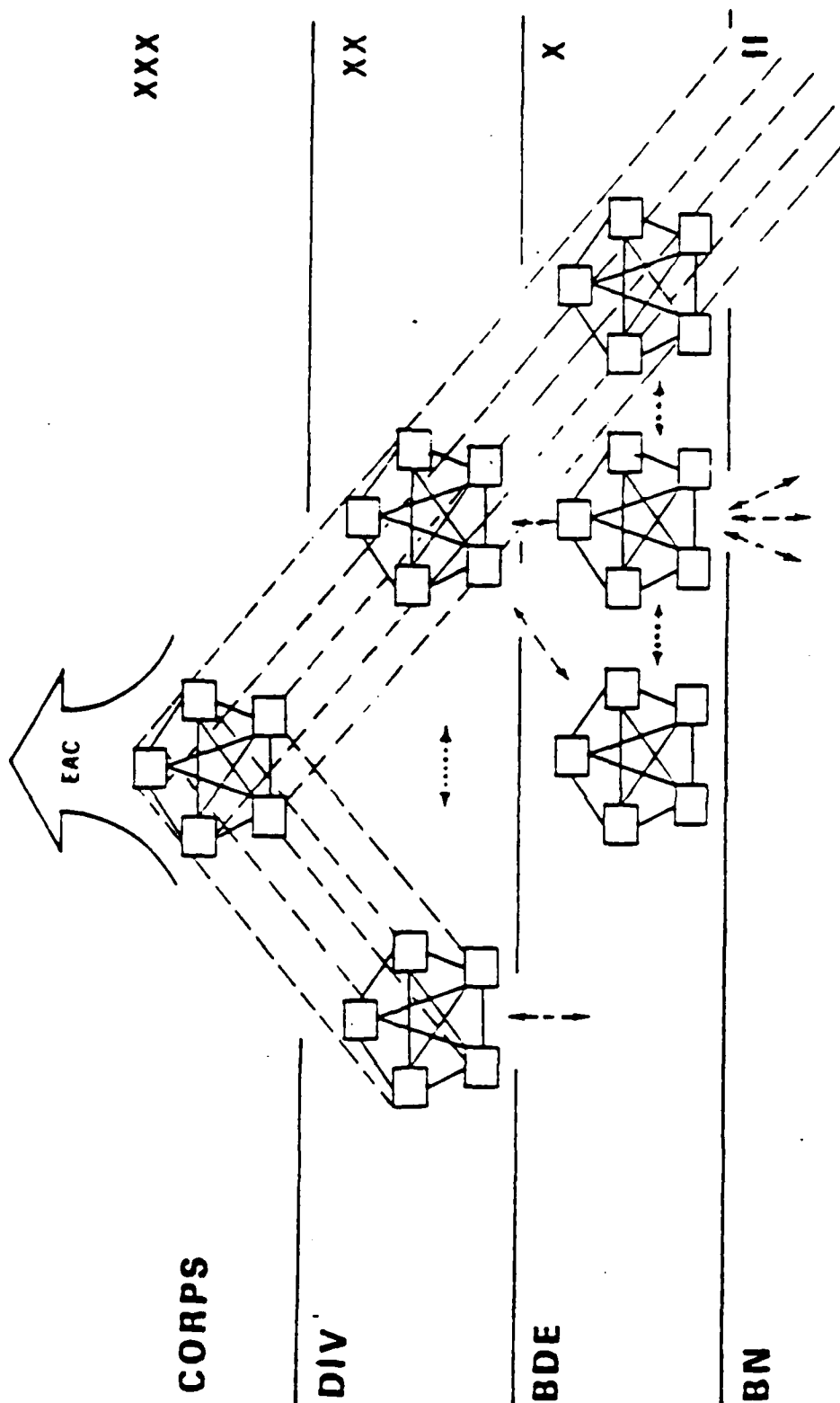


Figure 2-2. Information flows

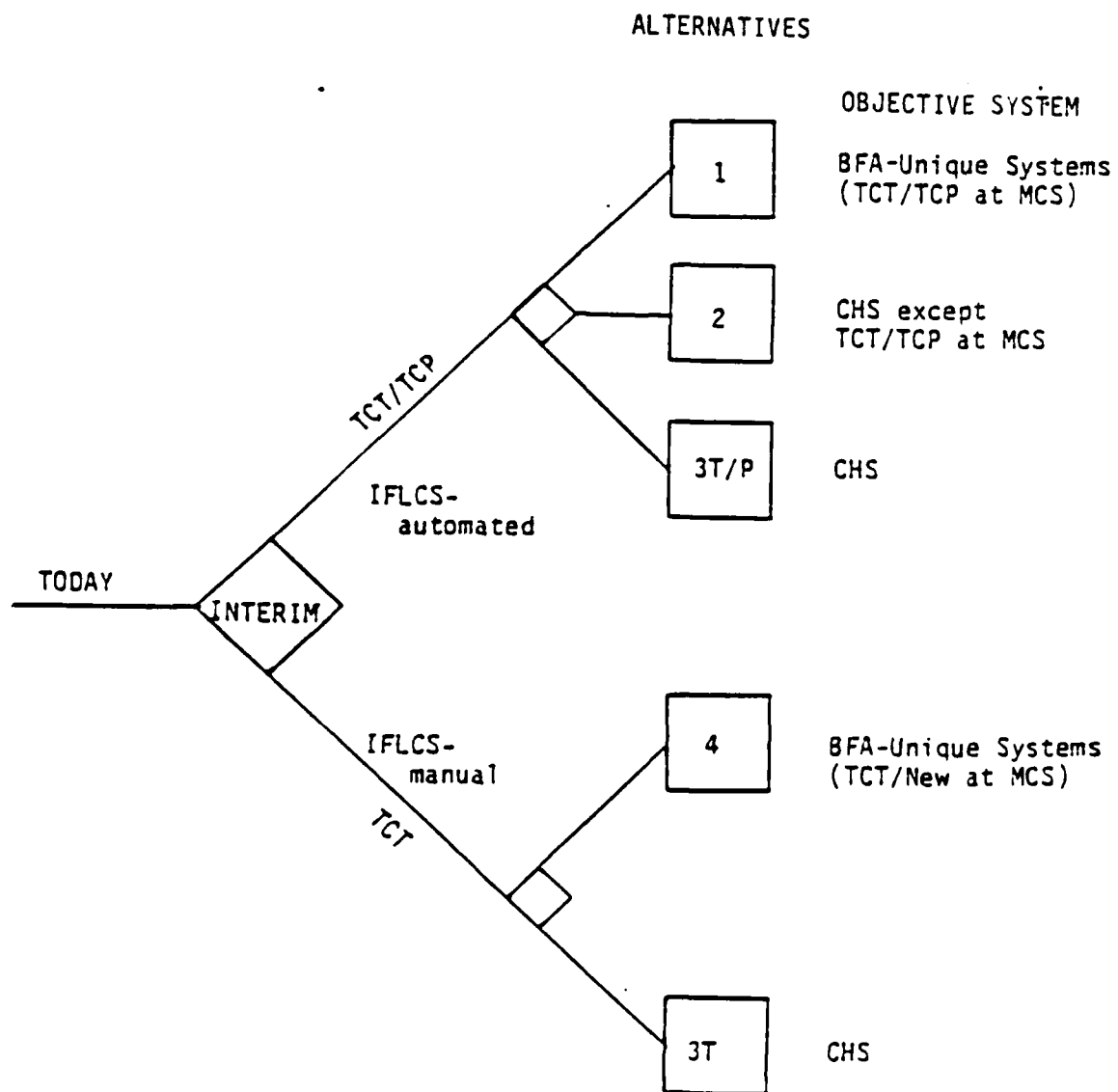
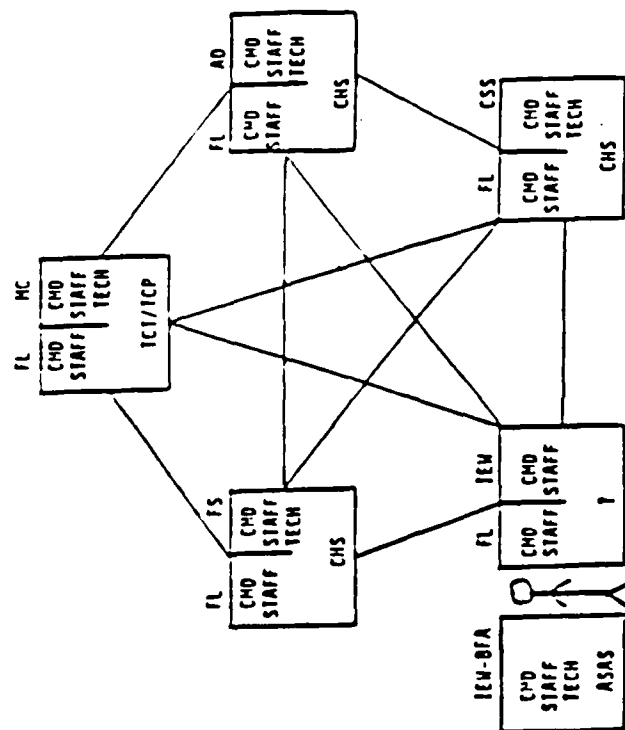


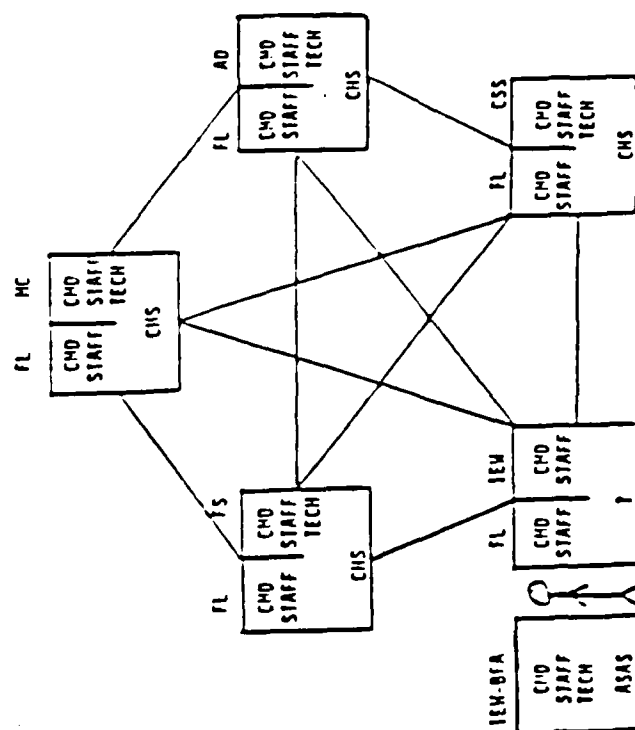
Figure 5-1. ATCCS automation alternatives

CHS

BFA Unique

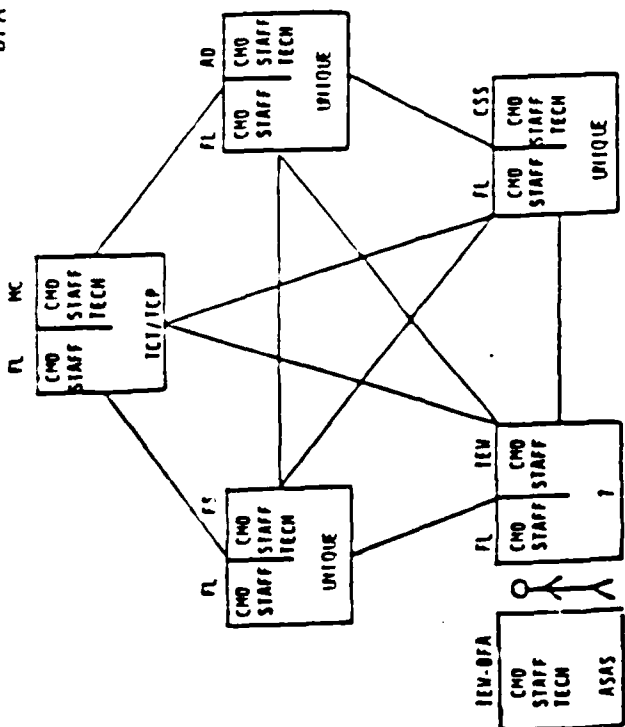


Alternative 2

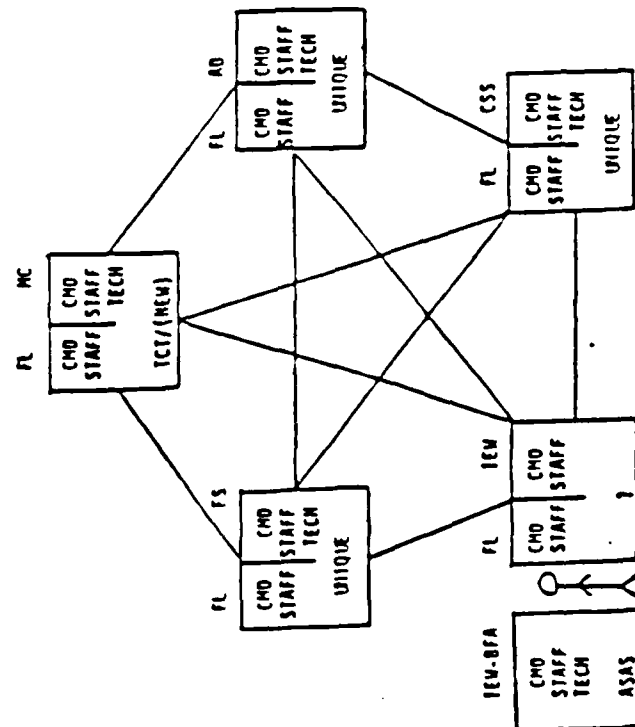


Alternatives 3I/P and 3I

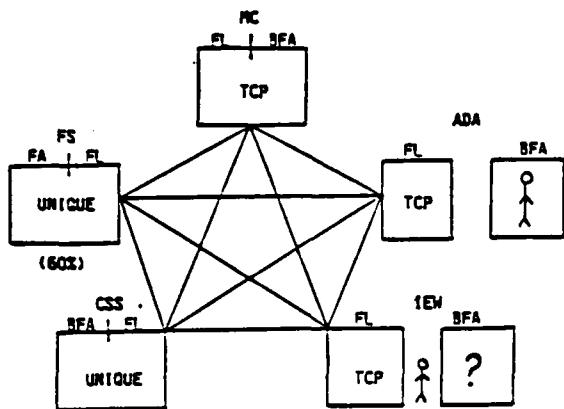
Alternative 1



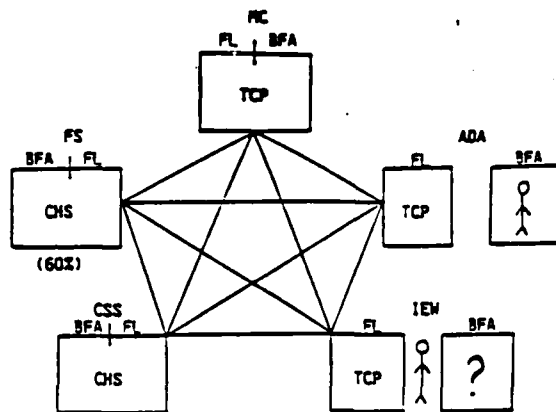
Alternative 4



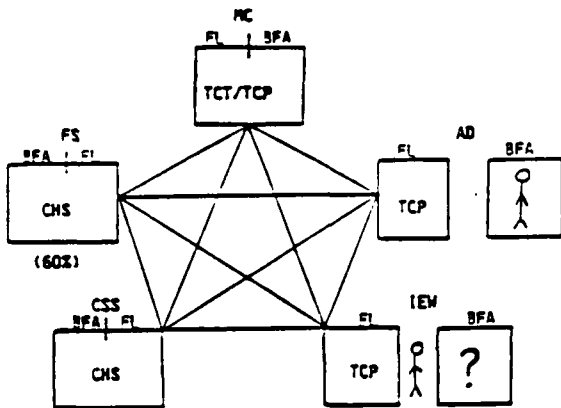
ALTERNATIVE 1



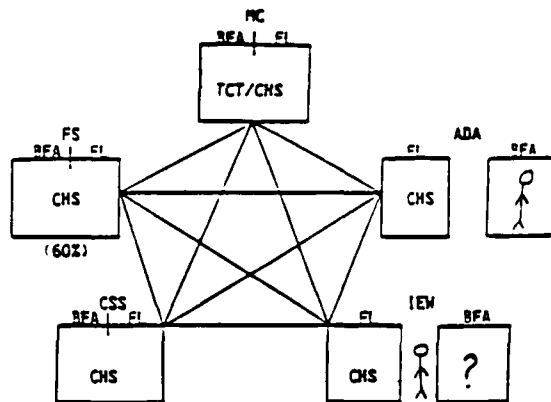
ALTERNATIVE 2



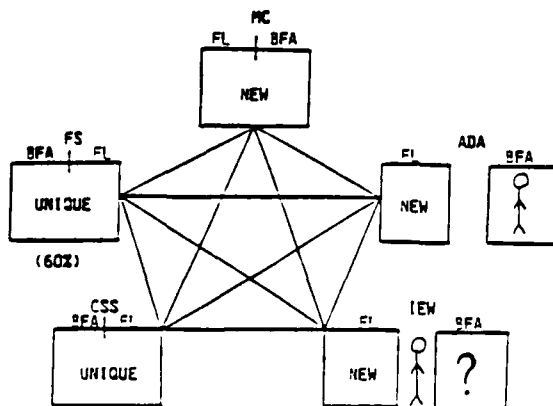
ALTERNATIVE 3T/P



ALTERNATIVE 3T



ALTERNATIVE 4





 : MANUAL INTERFACE
 : MANUAL SYSTEMS

Figure 5-3. Reserve component configurations

LOCATION	MC		FS		CSS		IEW		ADA	
	FL	BFA	FL	BFA	FL	BFA	FL	BFA	FL	BFA
SW	100%	100%	100%	60%	100%	100%	100%	??	100%	0%
ALT 1	TCP		UNIQUE		UNIQUE		TCP	?	TCP	
ALT 2	TCP		CHS		CHS		TCP	?	TCP	
ALT 3T/P	TCT/TCP		CHS		CHS		TCP	?	TCP	
ALT 3T	TCT/CHS		CHS		CHS		CHS	?	CHS	
ALT 4	NEW		UNIQUE		UNIQUE		NEW	?	NEW	

 : MANUAL SYSTEM


 : MANUAL INTERFACE

Figure 5-4. Reserve Component capabilities

1	2	3	4	
ALTERNATIVE	PARTIAL AUTO MCS ONLY (TCT)	IFLCS (TCT & TCP)	FLCS	
			a	b
			FIRST CORPS	LAST CORPS
ALT 1	87	88	93	97
ALT 2	87	88	92	96
ALT 3T/P	87	88	92	96
ALT 3T	87	NA	92	96
ALT 4	87	NA	93	97

Figure 5-5. Fielding schedule

ALT	MEASUREMENT OF CHARACTERISTICS, CAPABILITY, PERFORMANCE, AND EFFECTIVENESS	FIELDING TIMES			RESERVE COMPONENT CAPABILITIES	BFA CONCERNS
		AUTO MCS	AUTO IFLCS	AUTO FLCS		
1	POOR	87	88	93	TCP/UNIQUE	NONSTANDARDIZATION
2	FAIR	87	88	92	TCP/CHS	NONSTANDARDIZATION PROCESSING SPEED
3T/P	GOOD	87	88	92	TCP/TCT/CHS	PROCESSING SPEED
3T	GOOD	87	---	92	TCT/CHS	PROCESSING SPEED
4	POOR	87	---	93	TCT/NEW/UNIQUE	NONSTANDARDIZATION

Figure 5-6. Summary of alternatives attributes

ALT	MEASUREMENT OF CHARACTERISTICS, CAPABILITY, PERFORMANCE, AND EFFECTIVENESS	FIELDING TIMES			RESERVE COMPONENT CAPABILITIES	BFA CONCERNS
		AUTO MCS	AUTO IFLCS	AUTO FLCS		
1	POOR	NON DIS CR I M I N A T I O N I N G	GOOD	FAIR	POOR	FAIR
2	FAIR		GOOD	GOOD	FAIR	POOR
3T/P	GOOD		GOOD	GOOD	FAIR	FAIR
3T	GOOD		POOR (NONE)	GOOD	FAIR/GOOD	FAIR
4	POOR		POOR (NONE)	FAIR	POOR	FAIR

Figure 5-7. Generalized summary of alternatives' attributes

ATCCS CBA STUDY METHODOLOGY

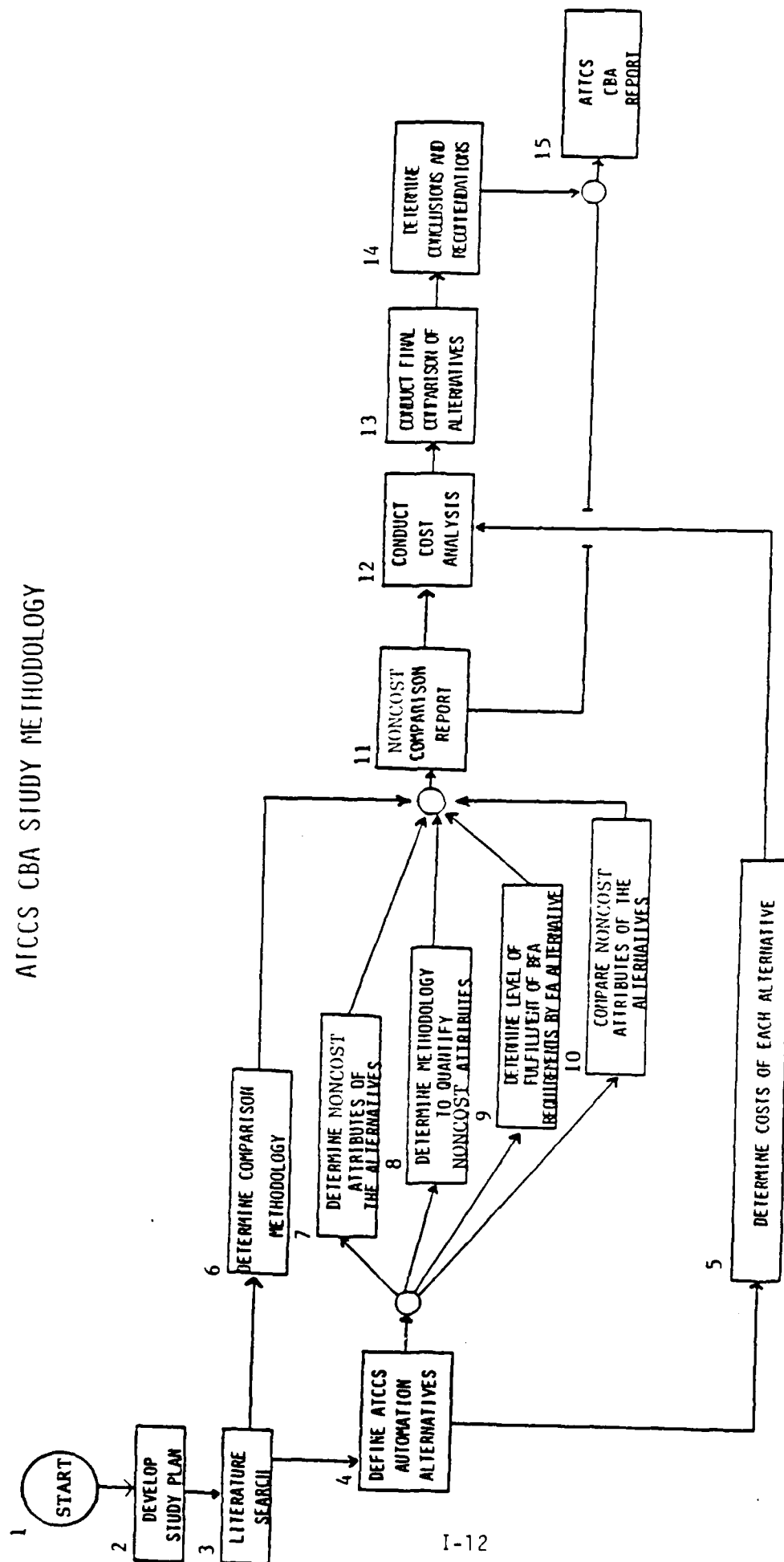


Figure F-1. The ATCCS CBA study methodology

CONTRIBUTION SCORE MATRIX

MEASURES OF SYSTEM CCPE

ALTERNATIVES	ABILITY TO EXCHANGING OPERATORS	ABILITY TO EXCHANGING EQUIPMENT	EASE OF HW SETUP	EASE OF TRAIN	EASE OF PERS MGMT	EASE OF MAINT MGMT	EASE OF SW MGMT
ALT 1							
ALT 2							
ALT 3T/P							
ALT 3T							
ALT 4							

Rating Scale

<u>Values</u>	<u>Description</u>
0	- This alternative provides <u>no contribution</u> to this criteria
1	- This alternative provides a <u>very weak</u> <u>weak contribution</u> to this criteria
2	- This alternative provides a <u>weak</u> <u>contribution</u> to this criteria
3	- This alternative provides a <u>moderately</u> <u>weak contribution</u> to this criteria
4	- This alternative provides a <u>moderately</u> <u>strong contribution</u> to this criteria
5	- This alternative provides a <u>strong</u> <u>contribution</u> to this criteria
6	- This alternative provides a <u>very strong</u> <u>contribution</u> to this criteria
7	- This alternative provide an <u>extreme</u> <u>(absolute) contribution</u> to this criteria

Figure G-1. Matrix for scoring of alternatives against CCPE

	EXCH OPS	EXCH EQUIP	HW SETUP	TRNG	PERS. MGMT	MAINT MGMT	SW MGMT
ALT 1	2.15	1.44	3.08	2.35	1.85	1.33	1.65
ALT 2	4.06	3.65	3.67	4.00	3.73	4.15	3.92
ALT 3T/P	5.71	5.42	4.48	5.46	5.04	5.52	5.58
ALT 3/T	5.71	5.38	4.54	4.92	4.90	5.67	5.58
ALT 4	2.25	1.23	2.92	2.35	1.81	1.64	1.71

Figure G-2. Average individual CCPE scores

	EXCH OPS	EXCH EQUIP	HW SETUP	TRNG	PERS. MGMT	MAINT MGMT	SW MGMT
EXCHANGE OPS		(3.6)	(5.5)	(2.6)	(2.9)	2.2	3.6
EXCHANGE EQUIP			3.8	4.9	5.1	6.0	5.7
HARDWARE SETUP				4.0	3.2	5.7	6.4
TRAINING EASE					3.4	3.7	4.0
PERSONNEL MGMT						3.1	5.3
MAINTENANCE MGMT							4.8
SOFTWARE MGMT							

RATING SCALE * **

1 - EQUAL IMPORTANCE

3 - FIRST CCPE MODERATELY MORE IMPORTANT

5 - FIRST CCPE STRONGLY MORE IMPORTANT

7 - FIRST CCPE VERY STRONGLY MORE IMPORTANT

9 - FIRST CCPE EXTREMELY MORE IMPORTANT

* PARENTHESES DENOTE AN INVERSE (USED WHEN SECOND CCPE MOST IMPORTANT)

** ALL VALUES BETWEEN 1 AND 9 MAY BE USED

Figure G-3. CCPE pairwise comparison results

CCPE	Weight (Relative Importance)
Ability to Exchange Equipment	.39
Simplicity of Hardware Setup	.25
Simplicity of Training	.13
Simplicity of Personnel Management	.09
Ability to Exchange Operators	.06
Simplicity of Maintenance Management	.05
Simplicity of Software Management	.03

* CR = .118

* The consistency ratio (CR) is a comparison of the consistency of the judgements made to total randomness. A CR of less than or equal to .1 is considered acceptable. Obviously CR = .118 is slightly above the acceptable amount. A change in the weights of the CCPE will be addressed under sensitivity.

Figure G-4. CCPE weights

	EXCH EQUIP: .39	HW SET: .25	TRNG: .13	PERS. MGMT: .09	EXCH OPS: .06	MAINT MGMT: .05	SW: .03	CONTRIBUTION SCORE*	GENERALIZED SCORE
ALT 1	1.44	3.08	2.35	1.85	2.15	1.33	1.65	2.05	1
ALT 2	3.65	3.67	4.00	3.73	4.06	4.15	4.92	3.80	2
ALT 3T/P	5.42	4.48	5.46	5.04	5.71	5.52	5.58	5.18	3
ALT 3T	5.38	4.54	4.92	4.90	5.71	5.67	5.58	5.11	3
ALT 4	1.23	2.92	2.35	1.81	2.25	1.64	1.71	1.95	1

GENERALIZED CONTRIBUTION RATING SCALE

3 - GOOD
2 - FAIR
1 - POOR
0 - NONE

CR = .118

*SCORE RANGE: 0 ≤ S ≤ 7

Figure G-5. Interim contribution score determined

ALT	IFLCCS (MANUAL INTERFACE TO BFA CS)		FLCCS (CCS2 CAPABILITY)	
	FIRST YEAR	GENERALIZED SCORE	FIRST YEAR	GENERALIZED SCORE
ALT 1	88	3	93	2
ALT 2	88	3	92	3
ALT 3T/P	88	3	92	3
ALT 3T	NA	0	92	3
ALT 4	NA	0	93	2

Figure G.6. Fielding schedule

Alt.	Distinguishing Characteristics	Implications	Score
Alt. 1	FL C2 for MC, AD, IEW handled by TCP FL C2 for FS, CSS handled by unique BFA C2 for MC handled by TCP BFA C2 for FS, CSS handled by unique Fielding starts in 1993	Extremely complicated SW Mgmt, Logistics, Training, Personnel Mgmt, Maintenance Mgmt, and HW Setup. Low equipment exchange capabilities.	1
Alt. 2	FL C2 for MC, AD, IEW handled by TCP FL C2 for FS, CSS handled by CHS BFA C2 for MC handled by TCP BFA C2 for FS, CSS handled by CHS Fielding starts in 1992	Complicated SW Mgmt, Logistics, Training, Personnel Mgmt, Maintenance Mgmt, and HW Setup. Moderate equipment exchange capabilities.	2
Alt. 3T/P	FL C2 for AD, IEW handled by TCP/TCP FL C2 & BFA C2 for MC handled by TCP/TCT FL C2 for FS, CSS handled by CHS BFA C2 for FS, CSS handled by CHS Fielding starts 1992	Complicated SW Mgmt, Logistics, Training, Personnel Mgmt, Maintenance Mgmt, and HW Setup. Moderate equipment exchange capabilities.	2
Alt. 3T	FL & BFA C2 for MC handled by TCT/ CHS FL & BFA C2 elsewhere handled by CHS Fielding starts in 1992	Relatively simple SW Mgmt, Logistics, Training, Personnel Mgmt, Maintenance Mgmt, and HW Setup. Relatively good equipment exchange capabilities.	2.5
Alt. 4	FL C2 for MC, ADA, IEW handled by NEW FL C2 for FS, CSS handled by unique BFA C2 for MC handled by NEW BFA C2 for FS, CSS handled by unique Fielding starts in 1993	Extremely complicated SW Mgmt, Logistics, Training, Personnel Mgmt, Maintenance Mgmt, and HW Setup. Low equipment exchange capabilities.	2

Scale

3 - Good
2 - Fair

1 - Poor
0 - Extremely Deficient (Unacceptable)

Figure 1- . Reserve component capabilities

ALTERNATIVE	BFA CONCERNS	SCORES
ALT 1	NONSTANDARDIZATION OF SYSTEM DESIGN	2
ALT 2	NONSTANDARDIZATION OF SYSTEM DESIGN PROCESSING SPEED	1
ALT 3T/P	PROCESSING SPEED	2
ALT 3T	PROCESSING SPEED	2
ALT 4	NONSTANDARDIZATION OF SYSTEM DESIGN	2

3 - GOOD

2 - FAIR

1 - POOR

0 - EXTREMELY DEFICIENT - UNACCEPTABLE

Figure G-8. Score of alternatives based on BFA concerns

	(A) CPPE	(B) TIMELINESS OF IFLCCS	(C) TIMELINESS FLCCS	(D) R.C. CAPABILITIES	(E) BFA CONCERNS
CCPE (A)					
TIMELINESS OF (B) IFLCCS					
TIMELINESS OF (C) FLCCS					
R.C. CAPABILITIES (D)					
BFA CONCERNS (E)					

Figure G-9. Pairwise comparison matrix of decision criteria

	(A) CPPE	(B) TIMELINESS OF IFLCCS	(C) TIMELINESS FLCCS	(D) R.C. CAPABILITIES	(E) BFA CONCERNS
CCPE (A)		A	A	A	A
TIMELINESS OF (B) IFLCCS			B	B	B
TIMELINESS OF (C) FLCCS				C	E
R.C. CAPABILITIES (D)					D
BFA CONCERNS (E)					

Figure G-10. Example pairwise comparison of decision criteria

Respondent	Decision Criteria Frequencies				
	A	B	C	D	E
N ₁ :	4	3	2	1	0
N ₂ :	3	2	4	1	0
N ₃ :	4	1	3	2	0
N ₄ :	3	4	2	1	0
N ₅ :	4	3	2	1	0
N ₆ :	4	2	1	1	2
N ₇ :	4	3	0	1	2
N ₈ :	4	3	2	1	0
N ₉ :	4	2	3	1	0
N ₁₀ :	3	4	1	2	0
Totals	37	27	20	12	4

Criteria	Total Frequencies	Relative Frequencies (Weights)
A	37	$37/100 = .37$
B	27	$27/100 = .27$
C	20	$20/100 = .20$
D	12	$12/100 = .12$
E	4	$4/100 = .04$
Total	100	

N_i respondent i

A: Measures of system characteristics, capabilities, performance, and effectiveness

B: Timeliness of the IFLCS

C: Timeliness of the FLCS

D: Automated C2 capabilities of the RC

E: BFA concerns

Figure G-11. Results of pairwise comparison

DECISION CRITERIA	CHARACTERISTICS, CAPABILITY, AND PERFORMANCE, AND EFFECTIVENESS SCORE	RESERVE COMP. AUTO FL CAP	TIMELINESS OF IFLCS	TIMELINESS OF FLCS	BFA CONCERNS	FINAL SCORE*	RANK
ALT WT.	.37	.12	.27	.20	.04		
ALT 1	1	1	3	2	2	1.78	4
ALT 2	2	2	3	3	1	2.43	2
ALT 3T/P	3	2	3	3	2	2.84	1
ALT 3T	3	2.5	0	3	2	2.09	3
ALT 4	1	2	0	2	2	1.09	5

* RANGE: $0 \leq S \leq 3$

Figure G-12. Scoring of the alternatives

END

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